SCHOOL CHEMISTRY

CLASS 7

Laboratory Manual

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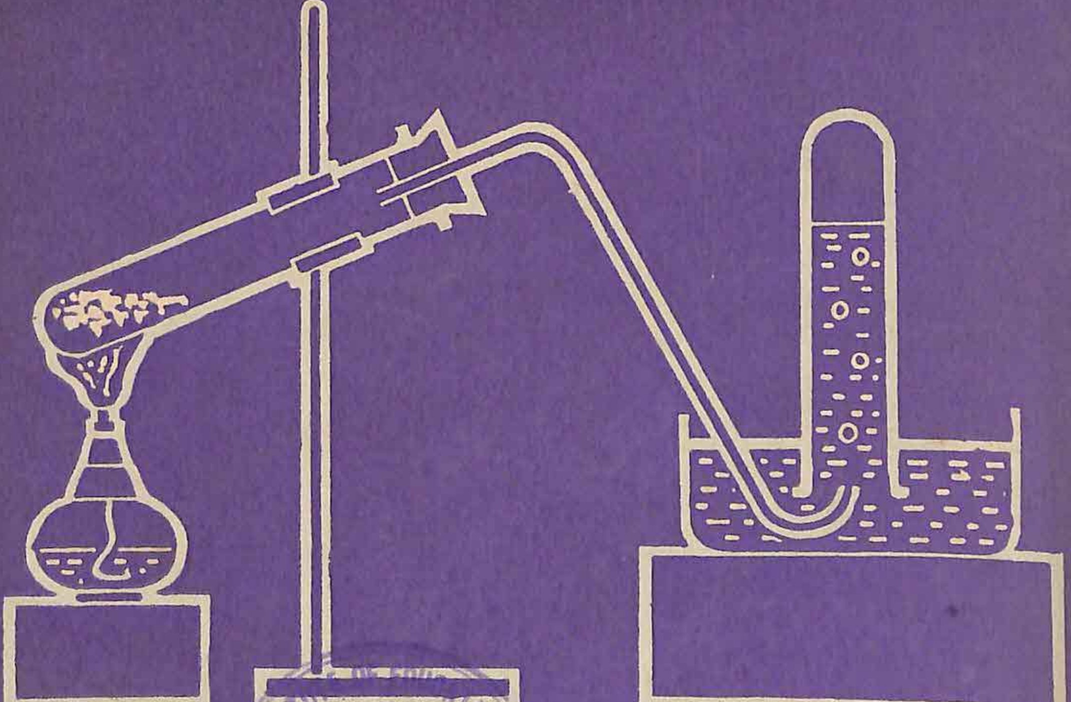

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NCERT CHEMISTRY STUDY GROUPS

EXPERIMENTAL EDITION

SCHOOL CHEMISTRY

CLASS 7

LABORATORY MANUAL

STATE INSTITUTE OF EDUCATION
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SCHOOL CHEMISTRY

CLASS 7

LABORATORY MANUAL

Prepared by

NCERT Chemistry Study Groups

Under a grant from

THE NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

NEW DELHI

PREFACE

The Education Commission recommended that teaching of science should commence at class 5 with physics and biology as separate disciplines and at class 6 with chemistry. This recommendation has been accepted by the Ministry of Education, Government of India and in pursuance of this, the National Council of Educational Research and Training has set up Study Groups to draw up a curriculum and develop teaching materials in various disciplines.

The Chemistry Study Groups, after long deliberation, considered it necessary that a new approach should be made to the study of chemistry at the school level. Essentially this approach is based upon pupil experimentation followed by teacher's demonstration and a discussion leading to an understanding of the principles of chemistry. Accordingly, the laboratory manual and text have been prepared for classes 6 and 7. The pupil is expected to carry out the experiments described in the laboratory manual either individually or in groups as indicated. In this approach, the pupil, apart from learning about the behaviour of substances, has also the thrill of finding something new all by himself. The teacher's demonstrations supplement the experimental work done by the pupils and lead to further discussion of the basic principles of chemistry.

For conducting these experiments it is not absolutely necessary to have a separate laboratory ; they can be carried out in a class room provided with suitable flat desks. The equipment needed is also of a simple and inexpensive nature.

The project was started in September 1966 and after several meetings of the Study Groups, a broad outline of the curriculum was drafted and later, the writing of the Laboratory Manual, Text and Teacher's Guide was undertaken. Some of the material prepared was tried out in a few schools, outside the normal curriculum, to find out the response from the pupils. The response has been encouraging, especially because of the experimental work involved.

The Directors and members of the Study Groups are conscious of the shortcomings and limitations of the material, which was prepared by assuming a certain level of knowledge on the part of the teacher. The practical difficulties in implementing the course will be obvious only after trial for a full academic year. For this reason the present material is being brought out as an experimental edition which will undergo revision in the light of the experience gained by trying it out in a number of schools. Helpful comments and suggestions for improvement of the Laboratory Manual as well as the Text will be gratefully received.

I will be failing in my duty, if I do not acknowledge the valuable help given by the Directors and members of the staff of the Study Groups as well as the staff of the Department of Science Education, National Institute of Education, New Delhi, in the preparation of this experimental edition. But for the financial support given by NCERT and encouragement by Dr. D. S. Kothari, Chairman, University Grants Commission, and Mr. L. S. Chandrakant, the then Joint Director of the NCERT, the project would not have taken shape. The Directors and members of the Study Groups gratefully acknowledge their help and encouragement.

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St. Ann's Girls' High School, Secunderabad.

Nrupatunga Multipurpose High School, Hyderabad.

R. K. Mission High School & Church Park Convent, Madras.

Kendriya Vidyalaya, Vallabh Vidyanagar.

D. N. High School & Kasturba Kanya Vidyalaya, Anand.

Shri Vividhalakshi Vidyamandir, Palanpur.

Sardar Patel High School, Boriavi.

They appreciate the services rendered by Sri G. Sivaram, artist, in preparing the illustrations.

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LABORATORY INSTRUCTIONS

1. Before coming to the laboratory, study carefully the instructions for conducting the experiment. Make a note of the precautions and exact measurements to be made.
2. New experiments may be done after consulting the teacher.
3. Record of the laboratory work must be submitted after each laboratory session.
4. Use only the required amounts of chemicals.
5. Do not touch chemicals with your hand unless directed to do so.
6. Do not taste any substance unless you are asked to do so by your teacher.
7. Use only matches (not strips of paper) to light your spirit lamp. Put out a lighted matchstick before throwing it away.
8. Never throw matches, filter paper or solids in the sink. Place them in the waste paper basket provided.
9. When heating substances in test tubes, make sure that the open end is pointed neither at your neighbour nor at yourself.
10. While handling hot articles, use a pair of tongs and keep them on an asbestos plate.
11. Never smell any gas or volatile substance directly. Waft the vapours towards you and smell.
12. Keep your apparatus and table clean. Avoid any spilling. If you spill something, clean it up immediately.
13. As far as possible see that your clothing do not touch the surface of the working table.
14. Do not pour concentrated acids into the sink. Pour them into a bucket containing water.

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BURNS AND ACCIDENTS

1. If any accident occurs while doing the experiment, report at once to your teacher.

2. In the case of acid burns, wash at once with a dilute solution of sodium bicarbonate and water and then apply an ointment of vaseline and boric or picric acid. For other burns apply only the ointment.

3. In the case of minor cuts, wash the spot with ferric chloride or alum solution until the bleeding stops. Apply cotton gauze soaked in tincture benzoin if it is a major cut.

4. If harmful chemicals fall on your skin, or in the eyes or in the mouth, dilute and flush them off with plenty of water. Then report to your teacher for first aid.

UNIT 5

CHEMICAL REACTIONS

In this unit you will study the various changes produced when different substances are made to react with one another. You will also study the factors affecting the rate of a chemical reaction.

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STUDY OF CHEMICAL REACTIONS - I

In this experiment you will carry out a few reactions and note the various changes produced.

Carry out the following reactions carefully and record your observations in the table given below.

Reaction	Change in appearance	Evolution of heat	Production of light	Evolution of gas	Formation of precipitate	Any other observation

Materials Required

Pair of tongs	
Watch glass	
Test tubes	4
Cork carrying a delivery tube	
Test tube holder	
Spirit lamp	
Box of matches	
Thread	25 cm

Magnesium ribbon	3 cm
Copper carbonate	1 g
Lime water	4 ml
Mercuric oxide	0.5 g
Copper sulphate solution	3 ml
Iron nail (5 cm)	
Splinter	

Procedure

Reaction 1. Burning of magnesium

Hold the magnesium ribbon with a pair of tongs and put it in the flame. When it starts burning, remove it from the flame and hold it over a watch glass. Record your observations.

Caution : *Do not look continuously at the burning magnesium ribbon. Dazzling light is harmful to the eyes.*

Reaction 2. Heating copper carbonate

Take about 1 g of copper carbonate in a test tube. Note its colour. Fit the test tube with a cork carrying a delivery tube. Dip the delivery tube in a test tube containing lime water (Fig. 5.1).

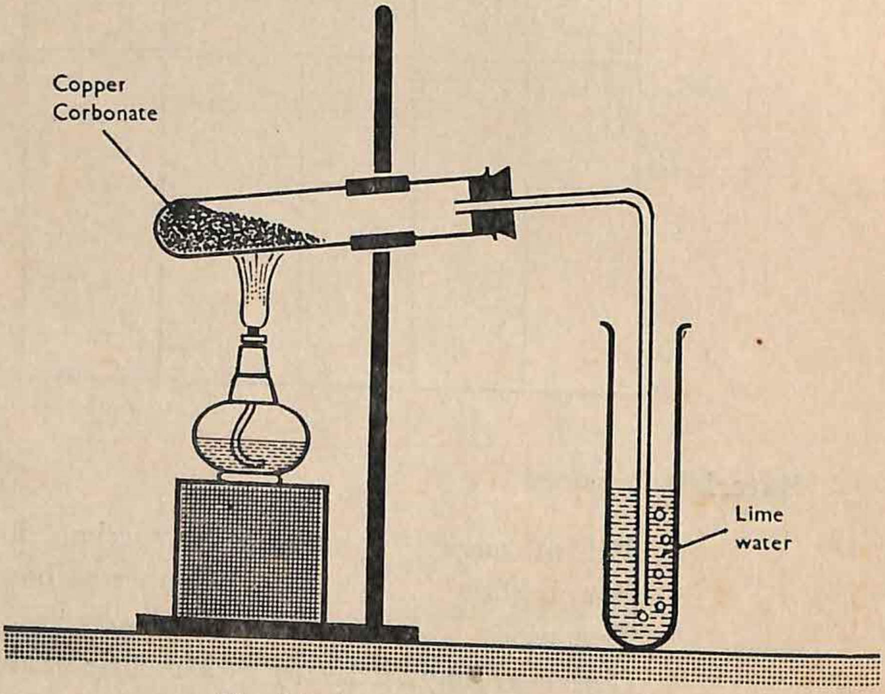

Fig. 5.1 Heating copper carbonate

Heat the copper carbonate gently. Observe and record any change

1. in the colour of copper carbonate,
2. in the lime water.

Remove the delivery tube from the lime water before heating is stopped.

Questions

1. Why is it necessary to remove the delivery tube from the lime water before heating is stopped?
2. What gas is evolved in the reaction?

Reaction 3. Heating mercuric oxide

Take about 0.5 g of mercuric oxide in a test tube. Note its colour. Heat the test tube for about 3 minutes. Observe the colour change. Introduce a glowing splinter into the test tube. Observe what happens to the splinter. Continue heating for 2 minutes. What do you observe on the walls of the test tube?

Reaction 4. Reaction of iron with copper sulphate solution

Place 3 ml of copper sulphate solution in a test tube. Tie the nail with a piece of thread and dip it in the solution in such a way that a portion of it remains immersed in the solution. Take the nail out after about 5 minutes. Observe and record the colour of the portion of the nail dipped in the solution. Note also the colour of the copper sulphate solution.

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STUDY OF CHEMICAL REACTIONS - II

In this experiment you will carry out a few more reactions.

Materials Required

Hard glass test tube		Quick lime	2 g
Test tubes	4	Sodium sulphate solution	3 ml
Test tube holder		Barium chloride solution	3 ml
Graduated test tube		Copper sulphate solution	5 ml
Watch glass		Sodium carbonate solution	5 ml
		Ammonium chloride*	1 g
		Sodium carbonate*	1 g

(* Use dry and powdered samples).

Procedure

Reaction 5. Addition of water to quick lime

Take about 2 g of quick lime in a hard glass test tube and hold it with a test tube holder. Touch the test tube. Do you feel it hot or cold? Add about 5 ml of water to the quick lime. What happens? After about 2 minutes, feel the test tube again with your hand (Care!). Do you find any difference now?

Reaction 6. Mixing solutions of sodium sulphate and barium chloride

Take 3 ml of sodium sulphate solution in one test tube and 3 ml of barium chloride solution in the other. Mix the two solutions and record your observations.

Reaction 7. Mixing solutions of copper sulphate and sodium carbonate

Take 5 ml of copper sulphate solution in one test tube and 5 ml of sodium carbonate solution in the other. Mix the two solutions. Record your observations.

Reaction 8. Mixing ammonium chloride and sodium carbonate

Mix the given quantities of ammonium chloride and sodium carbonate in a watch glass. Smell. Add a drop or two of water. Smell again. What is the smell due to?

Question

What do you learn from this reaction?

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FACTORS AFFECTING THE RATE OF A REACTION

In this experiment you will learn how particle size, concentration, temperature and a catalyst affect the rate of a reaction.

Materials Required

Test tubes	4	Zinc granules	5 g
Graduated test tube		Zinc dust	1 g
Test tube holder		Dilute hydrochloric acid	25 ml
Spirit lamp		Concentrated hydrochloric acid	5 ml
Box of matches		Manganese sulphate	0.5 g
		Acidified potassium permanganate solution	10 ml
		Oxalic acid solution	10 ml

Procedure

a. PARTICLE SIZE

Take about 1 g of zinc granules in one test tube and 1 g of zinc dust in the other. Add to each 5 ml of dilute hydrochloric acid. Note in which case the evolution of gas is more brisk.

b. CONCENTRATION

Take about 1 g of zinc granules (of about the same size) in each of two test tubes. Add at the same time 5 ml of concentrated hydrochloric acid to one test tube and 5 ml of dilute acid to the other. Note in which tube the evolution of gas is more brisk.

c. TEMPERATURE

Take 5 ml of dilute hydrochloric acid in each of two test tubes. Heat one of them (do not boil). Add simultaneously about 1 g of zinc granules (of about the same size) to each test tube.

In which tube is the evolution of gas more brisk?

d. CATALYST

Take 5 ml of acidified potassium permanganate solution in each of two test tubes. Add the given quantity of manganese sulphate to one. Now add at the same time 5 ml of oxalic acid solution to each of the test tubes. Note in which case the colour of permanganate solution disappears faster.

UNIT 6

SOME FAMILIAR SUBSTANCES

Air, water, common salt, charcoal and sulphur are substances familiar to us. In this unit you will prepare some of the important elements and compounds present in these substances and study their properties.

20

PREPARATION AND PROPERTIES OF OXYGEN

In this experiment you will prepare oxygen by heating potassium permanganate and collect the gas by the displacement of water. You will also study some of the properties of oxygen such as colour, odour and behaviour towards a glowing splinter.

Materials Required

Iron stand with adjustable clamp
Hard glass test tube
One-holed rubber stopper
Delivery tube
Trough
Test tubes with corks 2
Test tube stand
Wooden block
Spirit lamp
Box of matches

Potassium permanganate 2 g
Splinter

Procedure

Take about 2 g of potassium permanganate in a hard glass test tube. Close its mouth with a one-holed rubber stopper carrying a delivery tube. Wrap the test tube with a piece of paper near its neck and clamp it securely to the stand (Fig. 6.1). Do not clamp too tight; the test tube may break. Keep the end of the delivery tube under water in the trough.

Fill a test tube completely with water and close its mouth with your thumb. Invert the tube, dip it under water in the trough and remove your thumb carefully so that no air bubbles enter the tube.

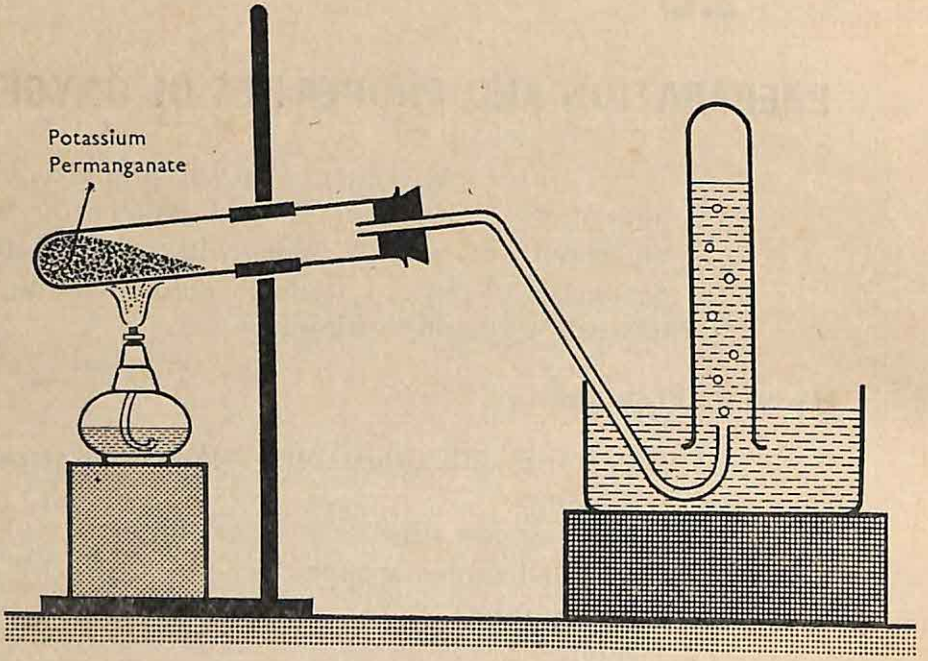

Fig. 6.1 Preparation of oxygen

Heat the hard glass test tube gently. Allow the bubbles initially formed to escape (these will contain mostly air). Now move the tube on to the tip of the delivery tube.

When the test tube is completely filled with gas, close its mouth with your thumb and remove it from the trough. Cork the test tube and place it in the test tube stand. In a similar way collect the gas in the other test tube. Then remove the delivery tube from the trough and put out the spirit lamp.

Properties of oxygen

1. Note the colour of the gas.

2. Remove the cork from one of the test tubes and note the odour.

3. Light a splinter and blow out the flame. Remove the cork of the other test tube and introduce the glowing splinter deep into the tube. Note what happens to the splinter.

Questions

1. What happens to the water in the test tube when oxygen starts collecting?
2. In this experiment oxygen is collected over water. From this what do you infer about the solubility of oxygen in water?

21

PREPARATION AND PROPERTIES OF NITROGEN

In this experiment you will prepare nitrogen by warming an aqueous solution of ammonium chloride and sodium nitrite. You will also study some of the properties of nitrogen such as colour, odour and behaviour towards a burning splinter.

Materials Required

Iron stand with adjustable clamp	
Hard glass test tube	
One holed rubber stopper	
Delivery tube	
Trough	
Test tubes with corks	2
Test tube stand	
Wooden block	
Graduated test tube	
Spirit lamp	
Box of matches.	
Ammonium chloride	1 g
Sodium nitrite	1 g
Splinter	

Procedure

Take 1 g of ammonium chloride and 1 g of sodium nitrite in a hard glass test tube. Dissolve them in about 5 ml of water. Clamp the tube vertically and attach the delivery tube (Fig. 6.2).

Heat the tube very gently.

Caution: *The reaction may become violent if the tube is heated strongly.*

Stop heating when the first few bubbles appear. Allow the first few bubbles to escape and then collect the gas in two test tubes (follow the procedure described in experiment 20). Remove the delivery tube from the water in the trough.

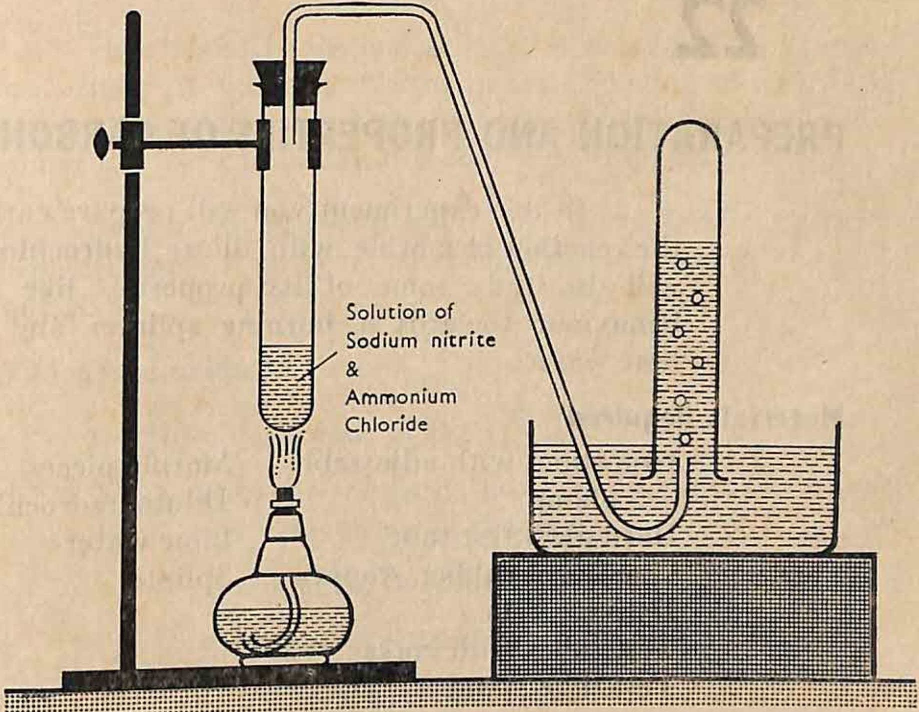

Fig. 6.2 Preparation of nitrogen

Properties of nitrogen

1. Note the colour of the gas.

2. Remove the cork of one of the test tubes and note the odour of the gas.

3. Remove the cork of the other test tube and introduce a burning splinter into the tube. Note what happens to the splinter. Does the gas burn?

Question

Is nitrogen soluble in water?

22

PREPARATION AND PROPERTIES OF CARBON DIOXIDE

In this experiment you will prepare carbon dioxide by the reaction of marble with dilute hydrochloric acid. You will also study some of its properties like colour, odour, behaviour towards a burning splinter and reaction with lime water.

Materials Required

Iron stand with adjustable clamp	
Hard glass test tube	
One-holed rubber stopper	
Delivery tube	
Test tubes with corks	2
Test tube stand	
Marble pieces	1 g
Dilute hydrochloric acid	5 ml
Lime water	5 ml
Splinter	

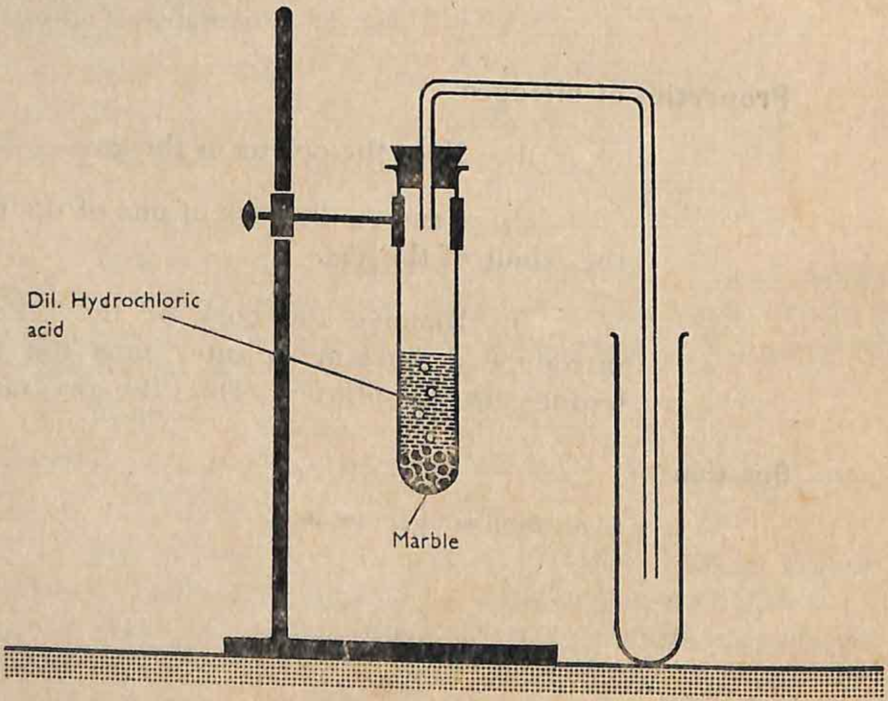

Fig. 6.3 Preparation of carbon dioxide

Procedure

Take about 1 g of marble pieces in a hard glass tube and clamp it securely to the stand. Add 5 ml of dilute hydrochloric acid. Fit the tube quickly with a one-holed rubber stopper carrying a delivery tube (Fig. 6.3).

Collect the gas evolved in two test tubes by upward displacement of air, cork them and keep them in the test tube stand.

Properties of carbon dioxide

1. Note the colour of the gas.
2. *a.* Remove the cork of one of the test tubes and note the odour of the gas.
   b. Introduce a burning splinter into it and note
      (i) what happens to the splinter,
      (ii) whether the gas burns.
3. Remove the cork of the other tube and pour 2 ml of lime water into it. Close the tube with your thumb and shake well. Observe what happens.

Question

Is carbon dioxide gas heavier or lighter than air?

23

PREPARATION AND PROPERTIES OF HYDROGEN

In this experiment you will prepare hydrogen by the reaction of zinc with dilute sulphuric acid and study some of its properties like colour, density and behaviour towards a burning splinter.

Materials Required

Iron stand with adjustable clamp	
Hard glass test tube	
One-holed rubber stopper	
Delivery tube	
Trough	
Test tubes with corks	2
Graduated test tube	
Wooden block	
Spirit lamp	
Box of matches	
Zinc granules	2 g
Dilute sulphuric acid	5 ml
Splinter	

Procedure

Take about 2 g of zinc granules in a hard glass tube and clamp it securely to the stand. Add 5 ml of dilute sulphuric acid. Fit the tube quickly with a one-holed rubber stopper carrying a delivery tube (Fig. 6.4).
The evolution of gas takes place.

Caution : *There should be no flame near the apparatus set up for the preparation of hydrogen. This is to prevent the possible explosion of a hydrogen-air mixture.*

Allow the air bubbles initially formed to escape and then collect the gas in three test tubes, as was done in experiment 20. Cork the test tubes and keep them in the test tube stand.

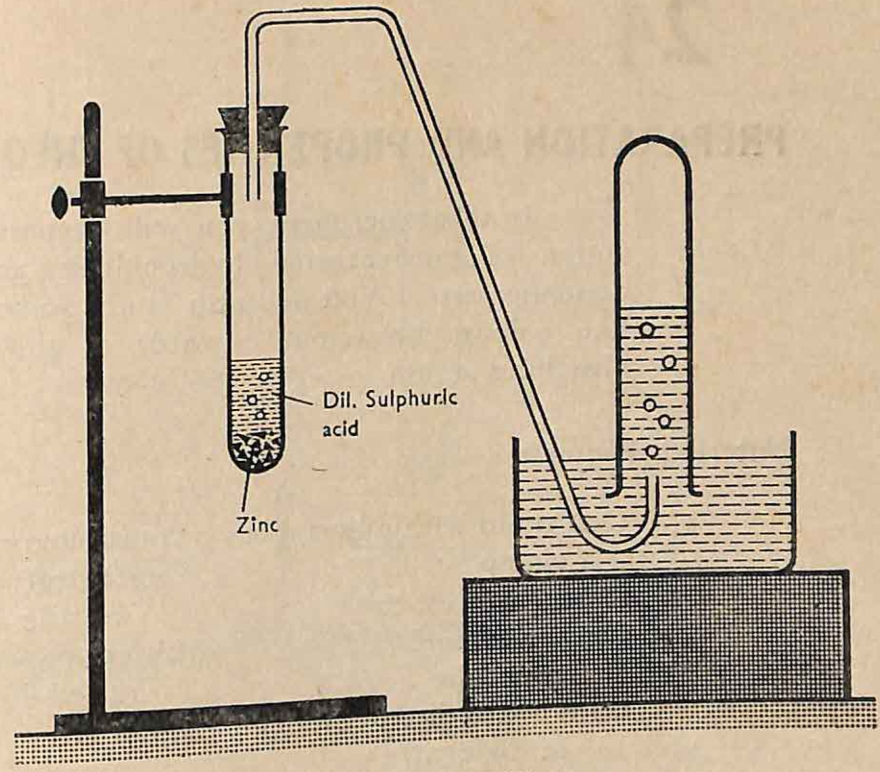

Fig. 6.4 Preparation of hydrogen

Properties of hydrogen

1. Note the colour and odour of the gas.

2. Hold one of the test tubes containing hydrogen with its mouth downwards. Remove the cork. Introduce a burning splinter into the test tube. Note what happens to the splinter. Does the gas burn ?

Caution : *While doing this test keep the test tube away from you.*

3. Hold the other test tube with mouth upwards. Remove the cork and wait for one minute. Then introduce a burning splinter into the test tube. Note what happens to the burning splinter.

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Questions

1. Is hydrogen soluble in water ?
2. Is hydrogen heavier or lighter than air ?

24

PREPARATION AND PROPERTIES OF CHLORINE

In this experiment you will prepare chlorine by the action of concentrated hydrochloric acid on potassium permanganate. You will also study some of its properties like colour, behaviour towards a glowing splinter and bleaching action.

Materials Required

Iron stand with adjustable clamp	
Hard glass test tube	
One-holed cork	
Delivery tube	
Card board disc with a hole at the centre	
Test tubes with corks	2
Test tube stand	
Potassium permanganate	1 g
Concentrated hydrochloric acid	4 ml
Litmus paper or petal of a red flower	
Splinter	

Procedure

Take about 1 g of potassium permanganate in a hard glass tube. Clamp the tube to the stand (Fig. 6.5). Add about 4 ml of concentrated hydrochloric acid. Fit the tube quickly with a one-holed cork, carrying a delivery tube. Introduce the delivery tube into a dry test tube through a card board disc.

The gas collects in the test tube by upward displacement of air. When the test tube is full (as seen from the colour inside the test tube and the gas escaping), remove it. Introduce the other test tube and collect the gas. Cork the tubes containing the gas and keep them in the test tube stand.

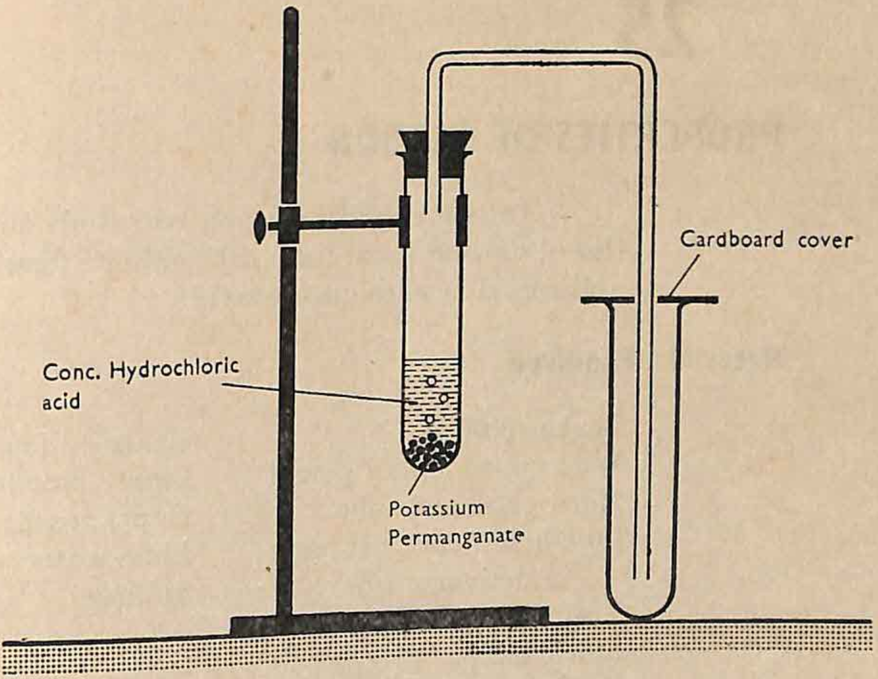

Fig. 6 5 Preparation of chlorine

Caution: *Avoid escape of the gas into the room. After the reaction is over add water to the hard glass tube. Pour out the contents into the sink. Flush the sink with plenty of water.*

Properties of chlorine

1. Note the colour of chlorine.

2. Remove the cork of one of the test tubes and introduce a glowing splinter into the gas and note what happens.

3. Drop a moist petal of a red flower or a moist litmus paper into the other test tube. Note any change that occurs.

Question

Is chlorine heavier or lighter than air?

25

PROPERTIES OF CARBON

In this experiment you will study some of the properties of carbon (charcoal), like colour, density, porous nature and reaction with cupric oxide.

Materials Required

Beaker (100 ml)
Wire gauze (small piece)
Hard glass test tube
One-holed cork carrying
a delivery tube
Test tube holder
Spirit lamp
Box of matches

Charcoal (small pieces)
Finely powdered charcoal 1 g
Cupric oxide 1 g
Lime water 2 ml
Splinter

Procedure

1. Note the colour and odour of charcoal.

2. *a.* Drop a piece of charcoal into a beaker of water. Does it float or sink ?

   b. Take out the charcoal, wrap a wire gauze around it, and put it back in the water. Boil the water for about 5 minutes.

   Pour away the hot water and add some cold water. Take out the gauze and charcoal, remove the gauze and drop the charcoal back into the water. Does the charcoal float or sink ?

3. Mix well finely powdered charcoal with cupric oxide on a piece of paper. Place this mixture in a clean and dry hard glass test tube. Hold it with a test tube holder. Heat the test tube strongly for about 5 minutes. Then

introduce a burning splinter into the test tube. What happens to the burning splinter?

Pass the gas evolved into lime water. Note what happens.

Question

What is the gas formed when charcoal is heated with cupric oxide?

26

PROPERTIES OF SULPHUR

In this experiment you will study the changes that sulphur undergoes on heating and burning.

Materials Required

Test tube	Sulphur	2 g
Test tube holder		
Glass rod		
Spirit lamp		
Box of matches		

Procedure

1. Take a small quantity of sulphur (0.5 g) in a test tube. Heat the tube carefully for about 3 minutes. Note any changes that occur.

2. Warm one end of the glass rod in the flame and then dip it in the sulphur. Some sulphur sticks to the rod. Hold the rod in a flame. When the sulphur begins to burn remove the rod from the flame. Note the colour of the sulphur flame and the odour of the gas formed.

UNIT 7

COMMON METALS AND ALLOYS

About three-fourths of the known elements are metals. They are widely used in daily life. The specific uses to which metals are put depend on their characteristic properties. In this unit you will carry out some experiments concerning the properties of metals. You will also learn how a metal is obtained from its oxide.

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PROPERTIES OF METALS

In this experiment you will study some characteristic properties of metals such as lustre, metallic sound, malleability, thermal conductivity and electrical conductivity.

a. LUSTRE

Materials Required

Magnesium ribbon	2 cm	Aluminium sheet	2 sq. cm
Copper foil	2 sq. cm	Sand paper	
Iron strip	2 sq. cm		

Procedure

Note the appearance of the samples of magnesium ribbon, copper foil, iron strip and aluminium sheet supplied. Clean the surface of each sample by rubbing with a sand paper and note its appearance again.

Questions

1. What is the effect of rubbing metals with sand paper?
2. Why are some metal surfaces dull before rubbing?

b. METALLIC SOUND

Materials Required

Wooden hammer

Copper vessel
Iron pipe
Lead pipe

Procedure

Strike the copper vessel, iron pipe and the lead pipe gently with a hammer. Note the sound produced in each case.

c. MALLEABILITY

Materials Required

Iron hammer	Tin granule
Block of iron	Zinc granule
	Lead shot

Procedure

Note the shape of the given lead shot. Place it on an iron block and strike it four or five times with a hammer. Note any change in the shape of the shot.

Repeat the above procedure using tin and zinc granules.

d. THERMAL CONDUCTIVITY

Materials Required

Metal disc carrying wires of iron, copper, aluminium and lead	Wax (candle) 2 g
Spirit lamp	
Box of matches	
Knife	

Procedure

Cut out small pieces of wax and attach one on each wire at a distance of 5 cm from the rim of the disc. Clamp the handle of the disc such that the disc is horizontal. Heat the centre of the disc with a spirit lamp. See that the flame is steady and the tip of the flame is directed at the centre of the disc (Fig. 7.1).

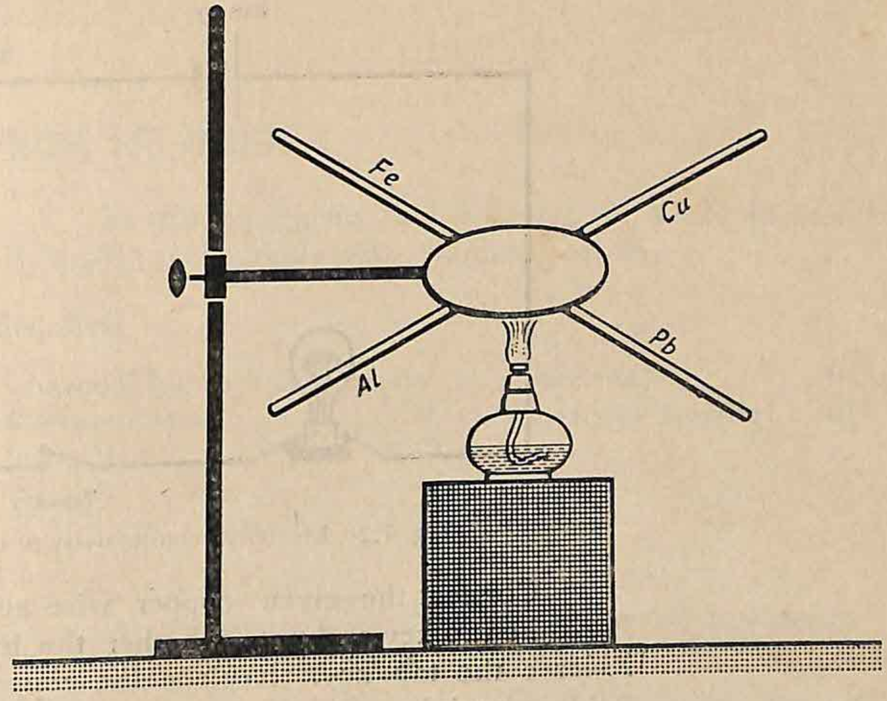

Fig. 7.1 Thermal conductivity of metals

Watch the wax pieces on the metal wires. Note the order in which they begin to melt.

e. ELECTRICAL CONDUCTIVITY

Materials Required

Battery		Copper wire	5 cm
Connecting wires (20 cm)	4	Aluminium wire	5 cm
Tap key			
Torch bulb			

Procedure

Assemble the apparatus and make connections (Fig. 7.2).

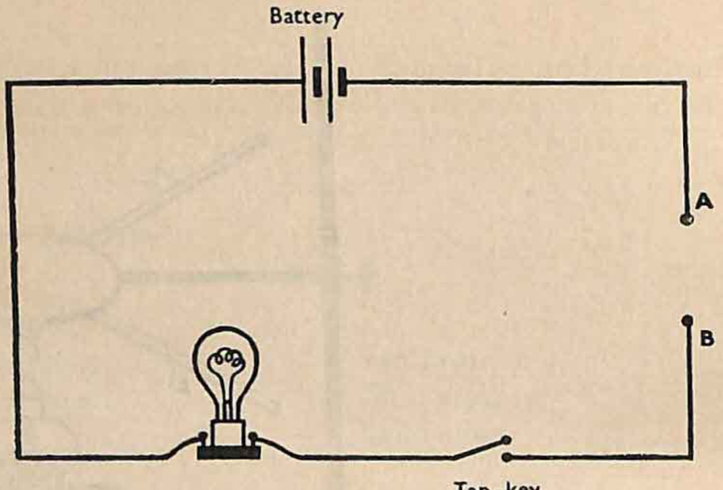

Fig. 7.2 Electrical conductivity of metals

Connect the given copper wire across the gap AB. Press the tap key and note whether the bulb glows for not. Release the tap key. Replace the copper wire in the gap AB by aluminium wire and repeat the experiment.

Question

What does the glow of the bulb indicate?

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METAL FROM ITS OXIDE

In this experiment you will prepare a sample of lead by heating lead oxide with charcoal powder.

Materials Required

Charcoal block with a cavity
Kerosene lamp
Blow pipe
Tongs

Lead oxide	0.2 g
Charcoal powder	0.2 g

Procedure

Mix the given lead oxide and charcoal powder on a piece of paper. Place the mixture in a charcoal cavity and moisten it with a drop of water. With the help of a blow pipe direct the flame of a kerosene lamp on to the mixture.

Continue heating until shining globules of lead are obtained. Allow the mass to cool.

Take out carefully a globule of lead and draw with it on a paper. Record what happens.

Questions

1. How is lead obtained from its oxide ?
   Write the equation.
2. What is the role of charcoal in this reaction ?

UNIT 8

ACIDS, BASES AND SALTS

Acids, bases and salts are widely used at home, in the laboratory and in industry. They play an important role in chemical reactions. In this unit you will do some experiments which reveal their properties.

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INVESTIGATION OF PROPERTIES OF ACIDS AND BASES

In this experiment you will study the behaviour of certain substances towards indicators, metals and metal carbonates and classify them as acids and bases.

Materials Required

Test tubes (20 ml)	5	Solutions labelled A, B, C, D, E	25 ml each
Graduated test tube		Blue litmus papers	5
Test tube stand		Red litmus papers	5
Dropper		Turmeric papers	5
One-holed cork carrying a delivery tube		Methyl orange	2 ml
		Phenolphthalein	2 ml
		Sodium carbonate	2 g
		Magnesium ribbon	5 cm
		Splinter	

Procedure

a. Action on indicators

Take 5 test tubes. Label them A, B, C, D and E. Pour about 5 ml each of solutions A, B, C, D and E in the test tubes marked correspondingly. Keep them in a test tube stand.

Dip a glass rod in solution A and touch it on blue and red litmus papers. Note if there is any change in the colour of blue and red litmus papers. Wash the glass rod thoroughly with water and repeat the experiment with solutions B, C, D and E and note the colour changes in each case.

In a similar way, test the solutions with turmeric paper and record your observations.

With the dropper add two drops of methyl orange to each of the test tubes containing the solutions and record the colour change.

Throw away the contents and wash the test tubes well with water. Again take 5 ml each of the five given solutions in the respective test tubes. Add two drops of phenolphthalein to each and note the colour change.

Record your observations in the table given below :

Test tube content	Change in colour				
	Blue litmus paper	Red litmus paper	Turmeric paper	Methyl orange	Phenolphthalein
A					
B					
C					
D					
E					

b. ACTION OF SODIUM CARBONATE

Take about 5 ml of solution A in a test tube and add a pinch of sodium carbonate to it. Record your observations. If there is evolution of any gas, introduce a burning splinter into the test tube. Pass the gas into lime water. (Add some more sodium carbonate to the test tube if sufficient gas is not produced). Repeat the experiment with solutions B, C, D and E and record your observations in the table given below :

Test tube content	Observations on		
	Addition of carbonate	Introduction of burning splinter	Passing the gas into lime water
A			
B			
C			
D			
E			

c. Action on metals

Take about 5 ml of solution A in a test tube and drop a piece of clean magnesium ribbon (1 cm) into it. Note what you observe. If there is evolution of any gas, introduce a burning splinter into the test tube. Pass the gas into lime water. Record your observations. Repeat the experiment with the solutions B, C, D and E and record your observations in the table given below :

Test tube content	Observations on		
	Addition of magnesium ribbon	Introduction of burning splinter	Passing the gas into lime water
A			
B			
C			
D			
E			

Question

Which of the solutions showed similar properties? Group them.

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TESTING SOME HOUSEHOLD MATERIALS AND SOILS FOR THEIR ACIDIC OR BASIC NATURE

In this experiment you will examine whether the household materials like milk, curd, lemon, tamarind, vinegar toothpaste and washing soap are acidic or basic. You will also test the acidic or basic nature of soils.

a. Household materials

Materials Required

Blue litmus papers	6	Milk	5 ml
Red litmus papers	6	Curd	
Watch glass		Lemon	
Test tubes	2	Tamarind	2
		Vinegar	5 ml
		Toothpaste	
		Washing soap	

Procedure

Take some fresh milk in a test tube. Dip blue and red litmus papers in it. Note if there is any change in their colour. Keep the test tube aside for about eight hours and test with litmus papers again. Do you find any difference?

Take a spoonful of curd on a watch glass and some vinegar in a test tube. Test them with blue and red litmus papers.

Cut a lemon, moisten some tamarind and soap. Touch each of them with litmus papers and note if there is any change in their colour.

Take some toothpaste in a test tube and shake with water. Test the suspension with litmus papers.

Record which substances are acidic and which are basic.

b. SOILS

Materials Required

Blue litmus papers	4
Red litmus papers	4
Watch glasses	4
Soil samples collected from four different places.	

Procedure

Take the samples of soil in different watch glasses, moisten and test the samples with blue and red litmus papers for their acidic or basic nature.

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INVESTIGATING THE REACTION BETWEEN ACID AND ALKALI SOLUTIONS

In this experiment you will find out what happens to the properties of acids and bases when appropriate amounts of their solutions are mixed.

Materials Required

Beakers (100 ml)	2
Glass rod	
Droppers	2
Graduated test tube	
Sand bath	
Test tube	
Spirit lamp	
Box of matches	
Evaporating dish	

Dilute hydrochloric acid	15 ml
Dilute sodium hydroxide	10 ml
Litmus solution	8 drops

Procedure

PART I

Take 1 ml of the given dilute acid in a test tube. Add 2 to 3 drops of litmus solution and place the tube in a test tube stand. Note the colour.

Add the given alkali to the acid solution dropwise by means of a dropper with occasional shaking till the colour changes to blue.

Then add the given acid solution drop by drop till the colour changes back to red.

Observe the effect of adding excess of alkali and acid alternatively and note the colour changes.

Questions

1. What happens to the acidic character of a solution when alkali is gradually added?
2. What happens to the alkaline character of a solution when acid is gradually added?

PART II

Take 10 ml of the sodium hydroxide solution in a beaker and add about 4 drops of litmus solution to it with a dropper. Note the colour change. With the help of another dropper add hydrochloric acid drop by drop to the sodium hydroxide solution in the beaker until the colour of the solution turns from blue to faint red.

Transfer the solution to an evaporating dish and place it on a hot sand bath. Evaporate the solution almost to dryness.

Remove the dish from the sand bath and allow it to cool. Transfer the solid on to a filter paper and dry it between the folds of filter paper. Dissolve it in water and test the solution with litmus papers.

Question

What are the substances formed when hydrochloric acid reacts with sodium hydroxide? Write the equation for the reaction.

32

PREPARATION OF A SALT BY THE ACTION OF AN ACID ON THE OXIDE OF A METAL

In this experiment you will prepare a sample of copper sulphate by the action of dilute sulphuric acid on copper oxide.

Materials Required

Beaker 250 ml
Glass rod
Glass tube
Funnel stand
Evaporating dish
Tripod stand
Water bath
Spirit lamp
Box of matches
Pair of tongs

Dilute sulphuric acid	40 ml
Cupric oxide	5 g

Procedure

Take 40 ml of dilute sulphuric acid in a beaker and warm gently. Add 5 g of cupric oxide to the hot acid, a little at a time and shake. Record your observations. Filter off the residue and collect the filtrate in an evaporating dish.

Place the dish over a sand bath and heat it to concentrate the solution. From time to time dip a glass tube in the hot solution and take it out. A little of the liquid remains in the tube and cools quickly. When the crystals start forming in the tube remove the dish and allow it to cool.

When the dish is cool, decant the clear liquid and transfer the crystals on to a filter paper. Dry them between the folds of filter paper. Observe the crystals formed.

Question

Write the equation for the reaction between cupric oxide and sulphuric acid.

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PREPARATION OF A SALT BY THE ACTION OF AN ACID ON A METAL

In this experiment you will prepare a sample of ferrous sulphate by the action of dilute sulphuric acid on iron powder.

Materials Required

Beaker 250 ml
Glass rod
Funnel stand
Evaporating dish
Tripod stand
Water bath
Spirit lamp
Box of matches
Pair of tongs
Filter paper.

Dilute sulphuric acid	45 ml
Iron powder	6 g

Procedure

Take 45 ml of dilute sulphuric acid in a 250 ml beaker and add the given quantity of the iron powder. Warm the contents of the beaker gently. Stir the contents with a glass rod.

When the reaction becomes vigorous, stop heating. Set the beaker aside and allow the reaction to proceed.

When the reaction stops, filter off the excess iron powder and collect the filtrate in an evaporating dish. Note the colour of the filtrate.

Heat the dish on a sand bath to concentrate the solution. From time to time dip a glass tube into the hot solution and take it out. A little of the liquid remains in the tube and cools quickly. If crystals appear in the tube, stop heating the dish. Remove the dish using a pair of tongs and allow it to cool. (If no crystals are formed, continue heating and test again as directed).

Decant the clear liquid into a trough and transfer the crystals to a filter paper. Dry them between the folds of filter paper and note the colour of crystals.

Questions

1. Write the equation for the reaction between iron and sulphuric acid.
2. What type of reaction is it?

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